Perspective

Sanitation Systems (/perspective/sanitation-systems-perspective)

Section

Sanitation Systems (/sanitation-systems/sanitation-systems)

Factsheet

# System 5: Biogas System

العربية (/ar/sanitation-systems/sanitation-systems/system-5:-biogas-system)

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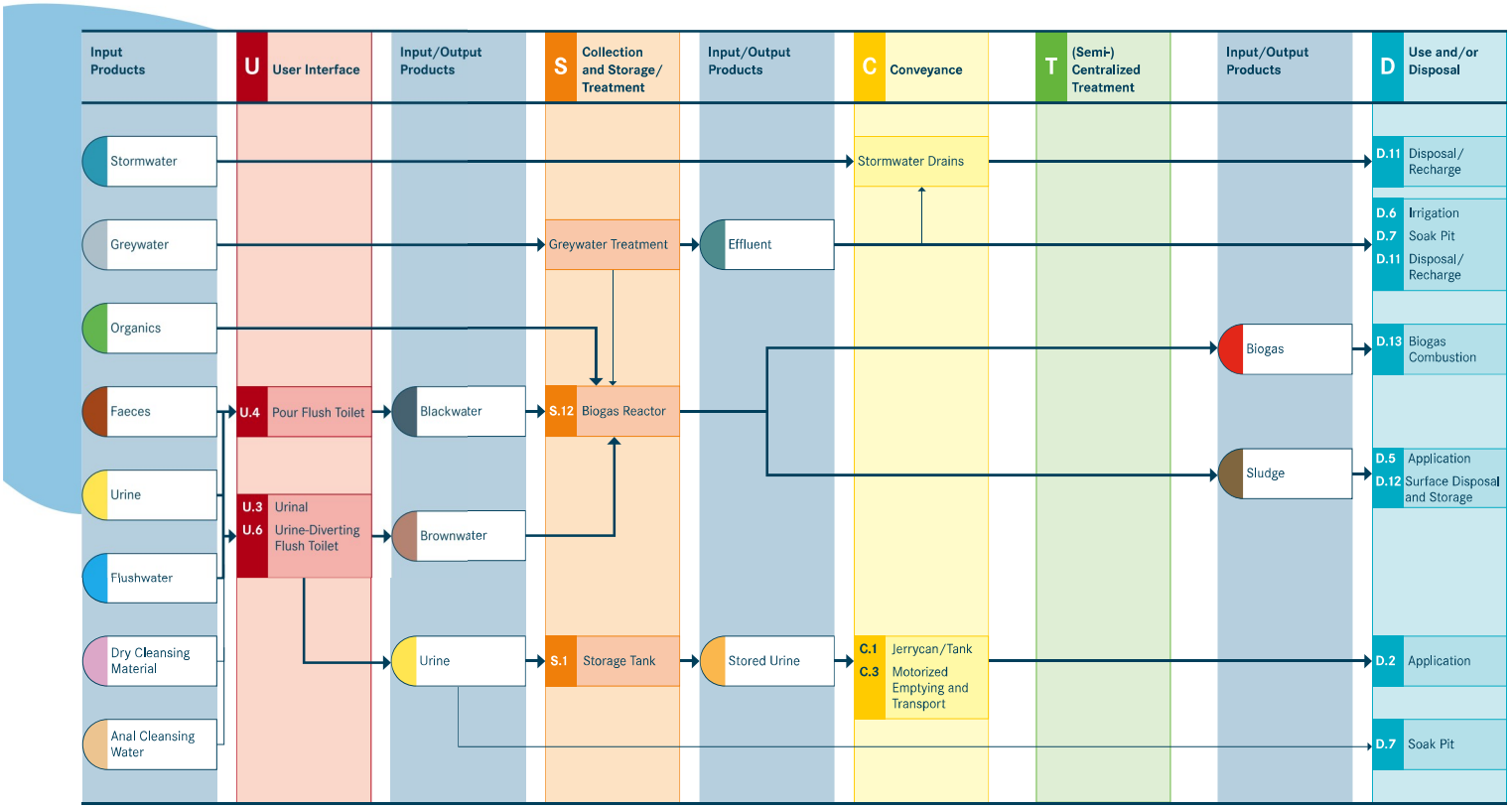
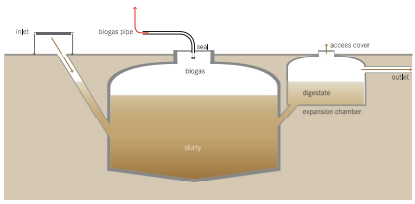
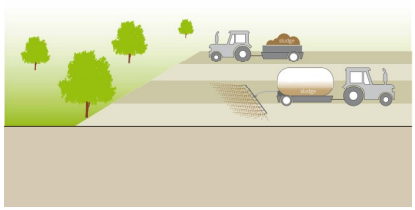
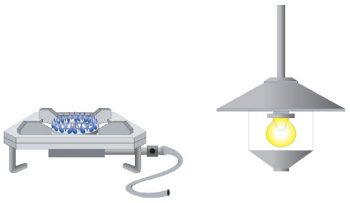
## Adapted from

**Compendium of Sanitation Systems and Technologies. 2nd Revised Edition (/node/5587)**





This system is based on the use of a **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** to collect, store and treat the Excreta. Additionally, the **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** produces Biogas which can be burned for cooking and/or lighting. Inputs to the system can include Urine, Faeces, Flushwater, Anal Cleansing Water, Dry Cleansing Materials, Organics (e.g., market or kitchen waste) and, if available, animal waste.

This system supports two different **user interface (/sanitation-technologies#group-u)** technologies: a **Pour flush Toilet (/sanitation-systems/sanitation-technologies/pour-flush-toilet)** or, if there is a demand for the urine to be used in agriculture, a **Urine-Diverting Flush Toilet (UDFT) (/sanitation-systems/sanitation-technologies/urine-diverting-flush-toilet-(udft))**. A **Urinal (/sanitation-systems/sanitation-technologies/urinal)** could additionally be used. The **User Interface (/sanitation-technologies#group-u)** is directly connected to a **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** (also known as an anaerobic digester) for **Collection and Storage/Treatment (/sanitation-technologies#group-s)**. If a **Urine-Diverting Flush Toilet (UDFT) (/sanitation-systems/sanitation-technologies/urine-diverting-flush-toilet-(udft))** is installed (and/or a **Urinal (/sanitation-systems/sanitation-technologies/urinal)**), it will be connected to a **Urine Storage Tank / Container (/sanitation-systems/sanitation-technologies/urine-storage-tank-/-container)**.

Depending on the loading and design of the **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)**, a thin or thick digestate (Sludge or slurry) will be continuously discharged. Because of the high volume and weight of the material generated, the Sludge should be used onsite. In some circumstances, a very thin digestate (Effluent) can be discharged to a sewer (though this is not shown on the system template here).

Although the slurry has undergone anaerobic digestion, it is not pathogen free and should be used with caution, especially if there is no further treatment. Depending on how it is used, additional treatment may be required before application (e.g., in **Planted Drying Beds (/sanitation-systems/sanitation-technologies/planted-drying-beds)**). It is nutrient-rich and makes a good fertilizer that can be applied in agriculture (**Application of Sludge (/sanitation-systems/sanitation-technologies/application-of-sludge)**) or transported to a **Surface Disposal and Storage (/sanitation-systems/sanitation-technologies/surface-disposal-and-storage)**. The Biogas produced must be constantly

used, and can be incinerated as a clean fuel for cooking or used for lighting (**Biogas Combustion (/sanitation-systems/sanitation-technologies/biogas-combustion)**). If the gas is not burned, it will accumulate in the tank and, with increasing pressure, will push out the slurry until the Biogas escapes to the atmosphere through the slurry outlet.

A **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** can work with or without Urine. The advantage of diverting Urine from the reactor is that it can be used separately as a concentrated nutrient source without pathogen contamination. The Urine collected in the Storage Tank is ideally applied on local fields (**Application of Stored Urine (/sanitation-systems/sanitation-technologies/application-of-stored-urine)**). Stored Urine can be transported in **Jerrycan / Tank (/node/7932)**, or using a **Motorised Emptying and Transport (/sanitation-systems/sanitation-technologies/motorised-emptying-and-transport)**.

## Considerations

This system is best suited to rural and peri-urban areas where there is appropriate space, a regular source of organic substrate for the **Biogas Reactor (/sanitation-systems/sanitation-technologies /biogas-reactor)** and a use for the digestate and Biogas. The reactor itself can be built underground (e.g., under agricultural land, and in some cases roads) and, therefore, does not require a lot of space. Although a reactor may be feasible in a dense urban area, proper Sludge management is crucial and needs specific attention. Because the digestate production is continuous, there must be provisions made for year-round use and/or transport away from the site.

The **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** can function with a large range of inputs and is especially suitable where a constant source of  animal manure is available, or where market and kitchen waste is abundant. On farms, for example, large quantities of Biogas can be produced if animal manure is co-digested with the Blackwater, whereas significant gas production would not be achieved from human Excreta alone. Wood material or straw are difficult to degrade and should be avoided in the substrate.

Achieving a good balance between Excreta (both human and animal), organic waste and water can take some time, though the system is generally forgiving. However, care should be taken not to overload the system with either too many solids or too much liquid (e.g., Greywater should not be added into the **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)** as it substantially reduces the hydraulic retention time).

Most types of Dry Cleansing Materials and Organics can be discharged into the **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)**, although to accelerate digestion and ensure even reactions within the tank, large items should be broken or cut into small pieces.

**Guidelines for the safe use of wasterwater excreta and greywater. Volume IV. Excreta and Greywater Use in Agriculture (/node/1133)** of Sludge have been published by

## Library References

### Compendium of Sanitation Systems and Technologies. 2nd Revised Edition

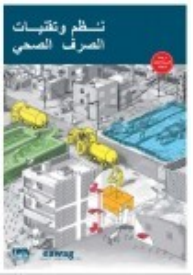
This compendium gives a systematic overview on different sanitation systems and technologies and describes a wide range of available low-cost sanitation technologies.

TILLEY, E. ULRICH, L. LUETHI, C. REYMOND, P. ZURBRUEGG, C. (2014): Compendium of Sanitation Systems and Technologies. 2nd Revised Edition. Duebendorf, Switzerland: Swiss Federal Institute of Aquatic Science and Technology (Eawag) **URL (http://www.eawag.ch/forschung/sandec/publikationen/compendium_e/index_EN)** [Accessed: 28.07.2014] **PDF (/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Compendium%20of%20Sanitation%20Systems%20and%20Tech**

**(/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Compendium%20of%20Sanitation%20Systems.**

## Further Readings

### Compendium of Sanitation Systems and Technologies (Arabic)



This is the Arabic version of the Compendium of Sanitation Systems and Technologies. The Compendium gives a systematic overview on different sanitation systems and technologies and describes a wide range of available low-cost sanitation technologies.

TILLEY, E. ULRICH, L. LUETHI, C. REYMOND, P. SCHERTENLEIB, R. ZURBRUEGG, C. (2014): Compendium of Sanitation Systems and Technologies (Arabic). 2nd Revised Edition. Duebendorf, Switzerland: Swiss Federal Institute of Aquatic Science and Technology (Eawag) **PDF (/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Arabic%20Compendium%20of%20Sanitation%20Systems.pdf)**

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